Modified Hospital Frailty Risk Score (mHFRS) as a Tool to Identify Hospitalised Older Adults at Risk of Frailty

Barbara H. Rosario[1] , Lydia Euphemia Sim[2], Aileen Lim[2], Thevapriya Selvaratnam[2], Chang Ting Yu[3], Simon Conroy[4],

[1]Department of Geriatric Medicine, Changi General Hospital, Singapore [2]Health Systems Intelligence, Changi General Hospital, Singapore, [3]National University of Singapore, Singapore [4] University College London, United Kingdom

Introduction

Frailty is a dynamic and developing state of health which involves the gradual loss of physiological in-built reserves leading to losses in one or more domains of human function (physical, cognitive, psychological and/or social) and increases the vulnerability of older adults to adverse health-related outcomes. (1) Frailty can be prevented, reversed, or delayed in the early stages and managed in the later stages, through early detection and interventions to optimize functional ability, activity participation and quality of life. (1) Frailty is prevalent amongst older people (2) and is associated with higher rates of utilization across various healthcare services, (3) including increased emergency admissions, (4) and has higher predictive risk for a range of adverse health outcomes. (5) Clinical Frailty Scale (CFS) is Singapore's nationally agreed frailty assessment tool (1) but requires a face-to-face assessment, requires time for adequate staff training prior to implementation and may also be associated with inaccuracies or paucity of documentation. Hospital Frailty Risk Score (HFRS) is a low-cost screening tool that does not require a clinical assessment but uses routinely collected electronic health records to risk stratify patients into low, intermediate or high risk of frailty. HFRS is easy to implement and has been validated in other populations. (7,8). However, HFRS is not available during a patients hospital admission and this study compared efficacy of a modified Hospital Frailty Risk Score (mHFRS) to standard HFRS and the Clinical Frailty Scale (CFS) to determine whether the mHFRS can be used to identify frail hospitalised patients.

Methods

Data collection included demographic data for age, sex and race and HFRS was calculated using an algorithm based on the methodology outlined in the literature (7,8). Patients were categorised into high risk (>15), intermediate risk (5-15) and low risk (<5) of frailty using HFRS. CFS was compared to HFRS and the modified HFRS. Length of stay, 30-day emergency hospital re-admissions and mortality at 30-days, and 90-days from the date of hospital admission. Predictive models were evaluated with correlation and the measure of agreement between frailty risk scores, CFS and HFRS, CFS and a modified HFRS (mHFRS) respectively, using the Spearman's rank correlation and Cohen's kappa (κ)

		HFRS group, n (%)		
		Low (<5)	Intermediate (5-15)	High (>15)
CFS group	Non-Frail (n = 1635)	**936 (57.2)**	515 (31.5)	184 (11.3)
	Frail (n = 1064)	226 (21.2)	**434 (40.8)**	404 (38.0)
	Severely Frail (n = 343)	32 (9.3)	122 (35.6)	**189 (55.1)**

CFS group
Non-Frail: 1 to 4
Frail: 5 & 6
Severely Frail: 7 to 9

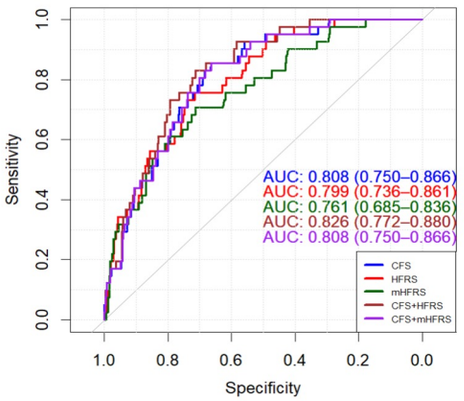
mHFRS was less sensitive at identifying frail patients compared to HFRS
Better specificity to identify non frail patients

		Modified HFRS group, n (%)		
		Low (<5)	Intermediate (5-15)	High (>15)
CFS group	Non-Frail (n = 1635)	**1335 (81.7)**	244 (14.9)	56 (3.4)
	Frail (n = 1064)	565 (53.1)	**315 (29.6)**	184 (17.3)
	Severely Frail (n = 343)	127 (37.0)	98 (28.6)	**118 (34.4)**

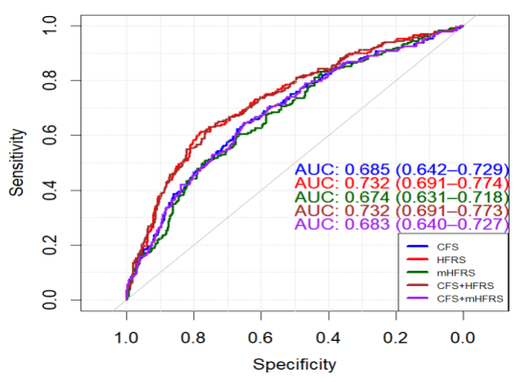
HFRS group
Low: <5
Intermediate: 5-15
High: >15

	CFS vs HFRS	CFS vs mHFRS
Precision	51.2%	58.1%
Sensitivity	51.2%	58.1%
Specificity	75.6%	79.1%
Micro-F1	0.512	0.581
Macro-F1	0.469	0.477
Balanced accuracy	0.510	0.486
Cohen's kappa	0.235	0.243
Mcnemer's test	<0.001	<0.001
Spearman's correlation coefficient	0.511	0.402

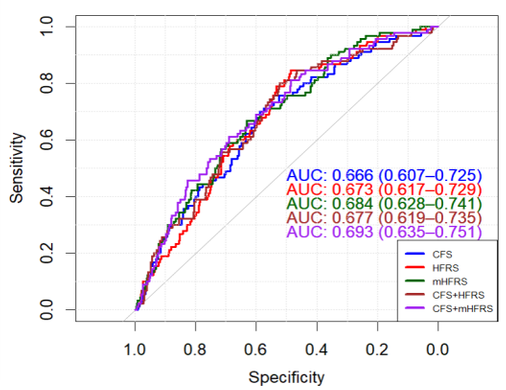
AUC ROC 30-day Mortality



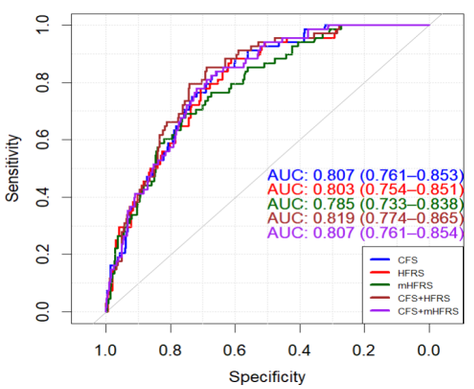
AUC ROC Length of Stay



AUC ROC 30-day re-admission

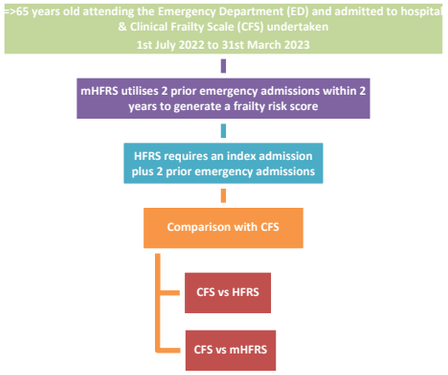


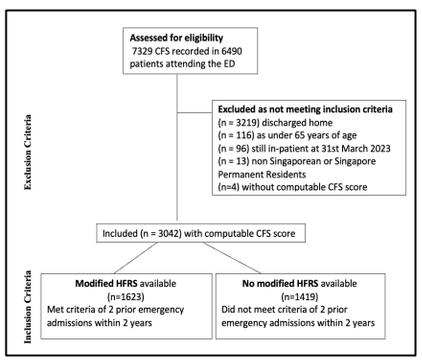
AUC ROC 90-day Mortality



Results:

Of 3042 patients, CFS categorised 1635 patients as non-frail (CFS 1-4) and 1407 as frail (CFS 5-9) (p=<0.001). Frail patients were older (81.8 years, SD 8.41 vs 75.3 years, SD 7.20, p=<0.001), had significantly longer LOS (defined as => 6 days) (52.5% % vs 31.5%, p=<0.001), higher 30-day unplanned hospital re-admission (18.5% vs 9.9%, p=<0.001) and mortality at all time points. Using mHFRS, only 1623 patients could be categorised and of these, 37.5% were deemed low risk, 40.5% intermediate risk and 22.1% high risk of frailty. mHFRS achieved comparable association with clinical outcomes between CFS & HFRS and CFS & mHFRS. HFRS could correctly identify severely frail patients compared to mHFRS, however, mHFRS was better at identifying non frail patients and had better overall sensitivity.





Discussion

HFRS cannot by computed until the patients admission episode is coded, which typically occurs 6-8 weeks after hospital discharge. To overcome this limitation, and to provide a scoring during hospitalisation, our study has used a modified version of HFRS which can be extracted directly from electronic health records to produce a frailty score during hospitalisation. Frailty measured by both CFS and HFRS was available for all 3042 patients, but mHFRS was only available for 1623 patients, as mHFRS cannot be computed for patients without any prior emergency admissions. Comparing the frailty scores, with CFS as the comparator, HFRS vs mHFRS identified 55.1% vs 34.4% of the severely frail, 40.8% vs 29.6% of the frail and 57.2% vs 81.7% of the non-frail patients. Despite the decrease in clinical information available when the index admission is not utilised, mHFRS was better at identifying non-frail patients and has better overall sensitivity (58.1%) and specificity (79.1%), although HFRS correctly identified severely frail patients.

Conclusion: mHFRS is a comparable frailty identification tool that can be used alone or in combination with CFS to provide rapid, easy and standardised frailty screening tool in those who can be scored.

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